BPS Cognitive Section 2017 Undergraduate Prize

Super-Face Recognisers: Long-Term Memory for Unfamiliar Faces

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Introduction

There are substantial individual differences in face recognition ability, ranging from *developmental prosopagnosics* (e.g. LeGrand et al., 2006) to *super-recognisers* (SRs) with exceptional abilities (Russell et al., 2009). Exceptional ability has law enforcement implications, with SRs having been deployed in policing to great effect (e.g. Davis et al., 2013).

The measurements employed in previous SR research only captured short-term mnemonic processes of face-recognition (i.e. *Cambridge Face Memory Test: Extended, CFMT+;* Russell et al., 2009). These processes may not always coincide with the cognitive demands within forensic operations that often draw on long-term memory (Deffenbacher et al., 2008).

In two different experiments, the current study was the first to examine the performance of a large group of SRs and 'average ability' controls on a newly developed task assessing long-term memory for *unfamiliar* faces.

Design and Materials

Cambridge Face Memory Test (CFMT+, Russell et al., 2009)

60 Trial White Male Old-New Face Memory Test **(STFMT):**
50% of trials were new (hits: 30 faces)
50% were old (correct rejections: 30 faces)

Long-term Face Memory Test (LTMT)

1. Learning phase: Video Stimuli:

- *Exposure Time:* 30 seconds *vs*. 60 seconds (see *Figure 1*)

2. Test phase: Line-ups (min 1 week delay)

- *Line-up Type:* Bespoke hybrid sequential/simultaneous video line-up *vs.* simultaneous still line-up (see *Figures 2* and *3*)
- *Target Presence:* Target-present *vs.* target-absent
  - Foils selected by Metropolitan Police using PROMAT™ (Promat Envision International, Nelson, Lancashire, UK) system from a national database of 23,000+ images

Allocation to SR and control groups

CFMT+ performance: Based on Bobak *et al*. (2016a)
- *SRs*: Scores of 95 out of 102 as minimum threshold (2 SD above the estimated population mean)
- *Controls*: Scores of 58 to 83 (within 1 SD of mean)

STFMT performance:
- *SRs* who met Bobak et al.'s SR threshold but scored 1 SD or more below the SR mean on the STFMT were excluded from the SR group
- *Controls* who scored 1 SD above or below the STFMT of control mean were also excluded.

Experiment 1 Participants

Experiment 1: 12.42% of participants (n = 1,324) achieved SR criteria (n = 118, 61.7% female) and 28.47% of participants met the control criteria (n = 250, 54.5% female)
(*note: correlations were also conducted with the inclusion of all participants – not reported here*)

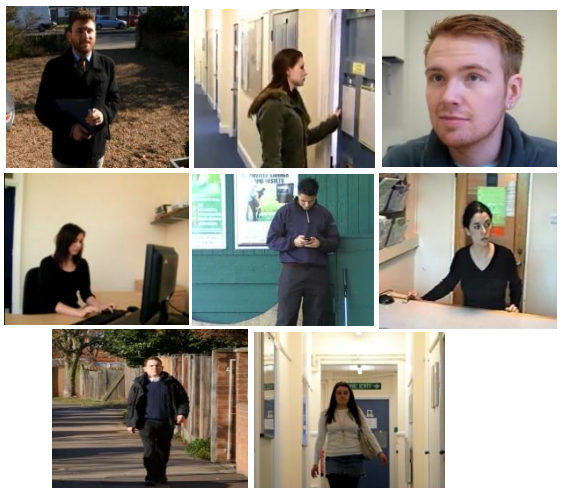

Figure 1. Stills from each of the eight videos presented in Phase 1

Figure 2. Stills from the target-present video line-up depicting Actor B (position number two)

Figure 3. Example of photographic line-up depicting the matched foils for Actor B in a target-absent trial

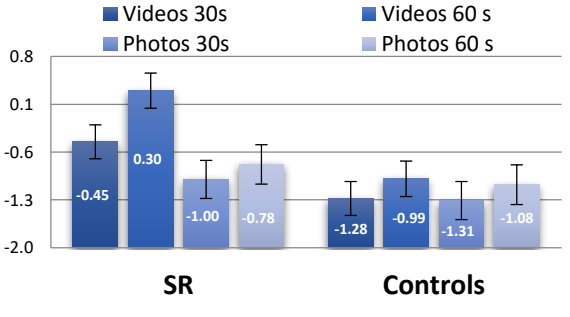

Figure 4. Mean sensitivity (d') on the LTMT as a function of group, exposure time, and line-up type in Experiment 1

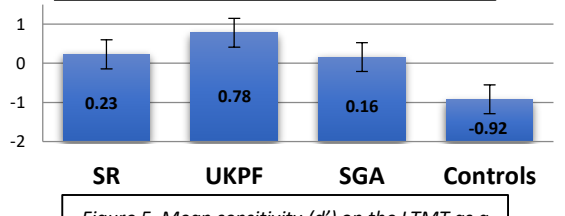

Figure 5. Mean sensitivity (d') on the LTMT as a function of group in Experiment 2

Experiment 1 Results

LTMT: 3-way mixed factorial ANOVA
- **DV**: sensitivity (d')
- **Within-participant factor**: Exposure time (30s/60s)
- **Between-participant factors**: Group (SRs/controls); line-up type (video/photo)

- Group main effect, $F(1, 364) = 15.95$, $p < .001$. SRs (M = -0.42, SD = 1.57) had higher sensitivity than controls (M = -1.02, SD = 1.29).
- Exposure length, $F(1, 364) = 5.02$, $p = .015$, and line-up type $F(1, 364) = 6.48$, $p = .011$ also significantly influenced sensitivity: 60s exposure (M = -0.77, SD = 2.13) enhanced sensitivity over 30s exposure (M = -1.10, SD = 2.02) as did moving (M = -0.74, SD = 1.49) over still line-ups (M = -0.95, SD = 1.31).
- The interaction between group and line-up type was significant $F(1, 364) = 4.84$, $p = .028$, with the movement-advantage being greater for SRs ($M_{difference}$ = -0.81) than for controls ($M_{difference}$ = -0.06) (see Figure 4).

Experiment 1 Conclusions

1. **SRs possess superior long term memory for unfamiliar faces** in comparison to controls
2. **Longer exposures** facilitated recognition in all groups
3. SRs derive proportionally more identification information **from moving images of unfamiliar faces**

Experiment 2 Participants

- **Police**: volunteers from a UK police force (UKPF) (n = 66) and a Singapore Government Agency (SGA) (n = 27) participating in a battery of tests to determine whether any officers should be deployed to work in a newly-established SR unit
- **SRs and controls**: 10% of Experiment 1 SRs (n = 12), and 10.5% of controls also met inclusion criteria (n = 29)

Experiment 2 Results

- An independent-measures one-way between-groups ANOVA (UKPF, SGA, SRs, controls) on LTFMT d/.
- **Sensitivity (d/)**: The ANOVA was significant, $F(3, 144) = 8.58$, $p < .001$, $\eta^2 = .154$. Low powered post-hoc tests found that SRs were marginally superior to controls (p = .055), UKPF ($p < .001$) and SGA outperformed controls (p = .072) (see *Figure 5*).

Experiment 2 Conclusions

- The **screening of personnel** within forensic and national security agencies would benefit from tests that are more ecologically valid and incorporate **long-term memory**

Further research

- The LTMT was very difficult, and is currently being updated in a third experiment
- Further research should use far longer delays
- Additional research should measure confidence and the enhanced recognition of SRs from moving images

References

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